AN APPROACH FOR IMPLEMENTING A MULTIDIMENSIONAL RECOMMENDATION SYSTEM FOR ONLINE RETAIL SERVICES OR PORTALS

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ABSTRACT

A newly proposed algorithmic approach that can be deployed in the implementation of recommendation system which can be used at the client as well as server end. PID is a closed loop, self-tuning algorithm which is predominantly implemented in mechatronics instruments where manual supervision is not feasible and it functions for corrections of errors quantifiable in physical measures. In this approach, we propose a similar outlook to an algorithm for implementation of recommendation system. There exist no physical errors in computer based systems as such but we can abstractly map this error to irrelevancy. If we were to map errors in physical dimensions to irrelevancy in computer systems it can be approximately stated to be higher the error, higher the irrelevancy. Also, the availability of multiple factor assessment in PID algorithms can be used to add multidimensional approach in implementation. As proposed and analysed the implementation is expected to provide with faster as well as large data compliant analytics option.

KEYWORDS: Data mining, Multidimensional recommendation system, Performance Analysis, PID algorithm, Product Equivalence Value, Self-Tuning.

I. INTRODUCTION

Digitization has led to an exponential growth in the online retail services and products, which in turn creates a huge amount of data. It is therefore of utmost importance to deploy efficient as well as fast algorithms in analytics process so as to gain higher profit. Recommendation algorithms have been designed to take some input information and generate relevant recommendations. These algorithms can be implemented in web based recommender systems to generate personal product recommendations in e-commerce sites, suggest social groups in social network websites or in search engines. Current recommendation system with traditional analysis techniques gets slower and inefficient while processing large data.

New recommender system technologies are needed that can quickly produce high-quality, relevant recommendations, even for very large-scale problems.

II. PROBLEMS IN CURRENT RECOMMENDATION SYSTEMS

Current systems are sometimes not scalable to the large data generated. Namely, Collaborative filtering has been shown to produce high quality recommendations, but the performance degrades with the number of customers and products. Results generated from current Recommendation Systems are not configurable to the user or organizational needs. Elementary approaches such as Collaborative Filtering are biased to the old items present in the inventory and can have difficulty showing new items.

Using a multi-dimensional approach in the implementation of recommendation system would render solution to the scalability problem and the self-tuning may provide better performance over traditional systems which are the main objective of this system.

III. OUR PROPOSAL

The goal is to build a comprehensive recommendation system for online shopping portals based on PID Algorithm.

A. PID Controller

A proportional–integral–derivative controller (PID controller) is a control loop feedback mechanism (controller) commonly used in industrial control systems. A PID controller continuously calculates an error value as the difference between the desired setpoint and a measured process variable and applies a correction based on proportional, integral and derivative terms (sometimes denoted P, I and D respectively) which give their name to the controller type.

- *P* accounts for present values of the error. For example, if the error is large and positive, the control output will also be large and positive.

- *I* accounts for past values of the error. For example, if the current output is not sufficiently strong, the integral of the error will accumulate over time, and the controller will respond by applying a stronger action.

- *D* accounts for possible future trends of the error, based on its current rate of change

B. Proposed PID Algorithm

Algorithm steps:
1. Initialize global variables

2. Define a test function for connectivity to the database.

3. Insert the data from unsorted ratings table to Sorted ratings table sequentially.

4. Define a function for counting the rows in a table.

5. Display the number of ratings by using the row count function mentioned in step 4.

6. Generate value of P function by evaluating sales rank and price.

7. Generate value of I function by making use of rating information in Sorted_ratings_table.

8. Generate value of D function by making use of the total number of ratings or any new parameter which can be determined by the business analyst.

9. Calculate PEV value from the values of the P function, I function and D function.

10. Select the number of items to be recommended for each user.

11. Update the values after successful rating and purchase operation.
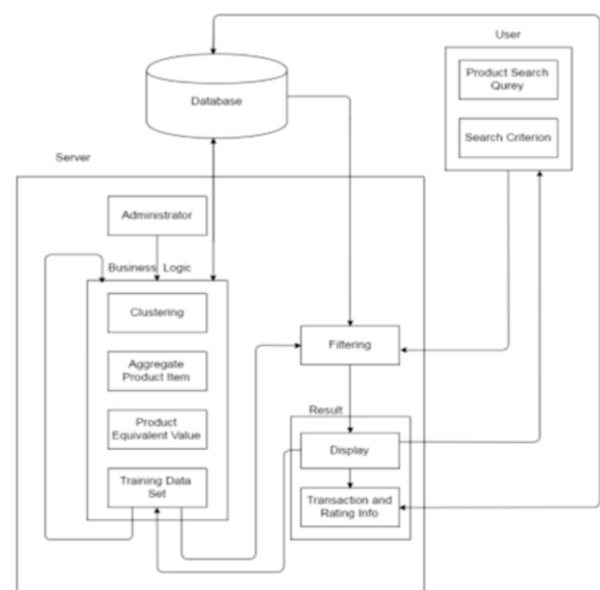
IV. SYSTEM ARCHITECTURE

Fig 1. Architecture

This Recommendation System Architecture shows various blocks such as Database, Server and User. The Database holds the data sets of the various product categories. In the server, we have the Business Unit which holds the Business logic for generating recommendation lists, i.e. PID algorithm along with other operations such clustering and aggregation which are essential for generating the PEV for each product.

The user block defines the tasks which can be performed by the end user.

V. CONCLUSION AND FUTURE SCOPE

The goal of most recommendation systems is to predict the buyers' interest and recommend products accordingly. The multidimensional recommendation engine which is proposed in this paper takes into account the various parameters and features available from the data set. Each feature is mapped to one of the three functions which constitute the PID algorithm, which then generates a PEV for each product. This PEV forms the basis on which an item is included in the recommendation list for a user.

The simple structure of the PID algorithm makes it easy for implementation, and provides a solution to the scalability and accuracy problems of the recommendation system, despite the issues at the time of a cold start scenario. Having more features and attributes to our disposal, on integrating with the proposed business logic, we can generate a more accurate recommendation list because it's taking more useful information into account for the recommendation process. The self-tuning nature of the algorithm enables the system to configure itself to generate relevant recommendations based on past, present and predicted future experiences. Despite the constraints with the database, the proposed solution gives an idea of the capability of using PID algorithm in the domain of recommendation systems.

Future Scope:
- Cloud based implementation.

- Real-time data stream integration.

- Generalizing the implementation so as to make it domain independent.

- Use of heuristic feature to determine the system configuration values.

- Implementing parallelism into the core business logic to provide a more effective solution

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REFERENCES

1. Bo-Yang Xing, Li-Ye Yu and Zhong-Kai Zhou, "Composite single neural PID controller based on fuzzy self-tuning gain and RBF network identification", in Control and Decision Conference (2014 CCDC), 2014.

2. Mehmet Korkmaz, mer Aydodu and Hseyin Doan, "Design and performance comparison of variable parameter nonlinear PID controller and genetic algorithm based PID controller", Innovations in Intelligent Systems and Applications (INISTA) 2012 International Symposium on, pp. 1-5, 2012.

3. Kiam Heong Ang, Gregory Chong and Yun Li, "PID Control System Analysis, Design and Technology", IEEE Transactions On Control Systems Technology", Vol 13, No.4, July 2005.

4. Linden, G., Smith, B. and York J: "Amazon.com recommendations: Item-to-item collaborative filtering", Industry Report-IEEE Internet Computing, Jan - Feb 2003, 7(1): pages 76 80.

5. Fabiana Lorenzi and Francesco Ricci, "Case-Based Recommender Systems: a Unifying View", proceedings from IJCAI 2003 Workshop, ITWP-2003, Acapulco, Mexico.

6. Tamas Jambor, Jun Wang and Neal Lathia, "Using Control Theory For Stable and Efficient Recommender Systems", in Proceedings 21st international conference on World Wide Web, Pages 11-20, ACM New York, NY,USA 2012, ISBN: 978-1- 4503-1229-5